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CRITERIA FOR SELECTION OF AN INFORMATION SOURCE

Thomas J. Allen
and
Peter G. Gerstberger

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ABSTRACT

The criteria employed by engineers in the selection of various technical information channels in problem-solving endeavors are investigated. The relationships of certain criteria identified in past research to such factors as frequency of channel utilization and the rate at which engineers accept or reject technical information received from specific channels are the focal points of the study.

A direct relationship is found between perceived accessibility of information channels and several objective measures of utilization, whereas no definite support is found for the hypothesis that the channels perceived highest in technical quality are those used most frequently. On the other hand, perceived technical quality shows a direct relation to message acceptance ratio.

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Before information technologists are able to design effective systems to provide the scientist and engineer with the information necessary for his work, a great deal must be learned about the behavior of the user population. Such research is requisite both to assess needs and to improve predictions of the impact on the total information system of new components or modifications of existing ones.

As a result, a large number of what have come to be called "user studies" (investigations of the information seeking behavior of scientists and engineers) have been performed over the past ten years. Such studies endeavor to determine (1) the effectiveness of currently used information channels, or (2) the criteria governing the selection of information channels. Most such studies, until very recently, have not, however, differentiated these two goals. They have implicitly assumed channel effectiveness to be the single criterion governing channel selection. Operating from this assumption, it was necessary only to observe the users and to assign performance measures to the channels on the sole basis of the extent to which they are used.

Allen (1966b; 1966c), applying an independent measure of effective channel performance, found no relation whatever between this measure and the extent to which each of eight channels were used. These results counter any assumption of information quality as the single criterion upon which channel selection is based. Allen proceeds to demonstrate the by now obvious fact that there exists in such a decision process a second parameter of considerable consequence. In addition to the value of a given channel, there is a certain cost associated with using it. The present study is directed at the measurement of relative costs associated with the use of each of nine information

channels by R&D engineers and the relative weights assigned cost and value in this decision process.

Cost in this sense is a rather complex concept. It may consist of many dimensions -- economic, psychological and physical. This study measures perceived cost to the user in terms of channel accessibility and ease of use. There is considerable support for the idea of measuring cost on these two dimensions. First, Allen's (1966c) data led him to hypothesize that the frequency with which a channel is used is principally determined by the accessibility of the channel to the engineer seeking information (Figure 1). Second, both Werner (1965) and Rosenberg (1966) conclude that the behavior of the users they studied appeared to be influenced by perceptions of the ease with which an information channel might be used.

Allen (1966c) goes on to propose that the perceived technical quality of information provided by an information channel is taken into account through a filtering process (Figure 1) during which the proportion of ideas rejected is greater for some channels than for others. The present study goes on to test this hypothesis by comparing the rate at which ideas are accepted or rejected for each of seven channels with engineers' perceptions of the technical quality and reliability of the information delivered by each of the channels.

RESEARCH METHODS

The study was conducted in two divisions of a large electronics firm. A sample of 33 engineers was initially selected; of these 19 remained fully cooperative over the 15-week period of the study.[1] Of the 19 cooperating

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[1] A comparison of the 19 cooperating engineers with the 14 non-cooperative ones shows no reason to suspect that they differ in terms of any background characteristics, or (from the evidence available) in terms of their information gathering behavior.

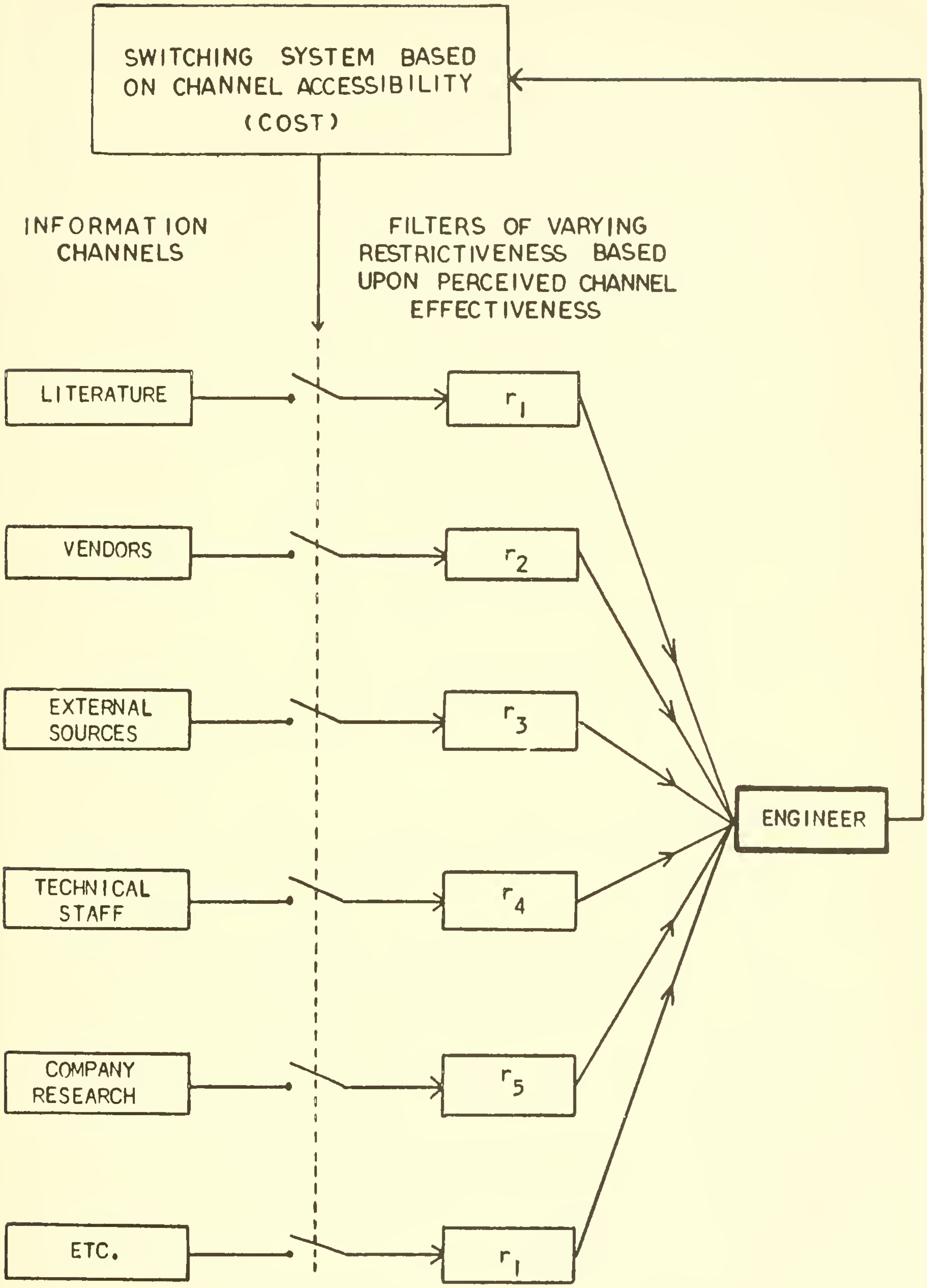
SWITCHING SYSTEM BASED ON CHANNEL ACCESSIBILITY (COST)
INFORMATION CHANNELS
FILTERS OF VARYING RESTRICTIVENESS BASED UPON PERCEIVED CHANNEL EFFECTIVENESS
LITERATURE
VENDORS
EXTERNAL SOURCES
TECHNICAL STAFF
COMPANY RESEARCH
ETC.
r_1
r_2
r_3
r_4
r_5
r_1
ENGINEER

FIGURE I. CHANNEL SELECTION AND FILTERING

Note: Reproduced from Allen (1966c).

engineers, eight are employed in one division, 11 in another. Those who are employed in the first division are further subdivided into those who work in a components laboratory and those who are with a systems laboratory. The two laboratories are separated by about one-half mile; the second division is 18 miles away. The mean age of the 19 cooperating engineers is 33 years and the range 24 to 43 years. Six have M.S. degrees, the remainder all hold B.S. degrees in engineering. They have been with their present company an average of five and one-half years.

The data were gathered by means of several specially designed questionnaires (Figures 2 and 3), combining the Solution Development Record (Allen, 1966a; 1966b) with a series of rank orderings of nine information channels (Table I) on the basis of each of four criteria:

(1) Accessibility - accessibility of the nine information channels (without giving consideration to the reliability or quality of the information expected).

(2) Ease of Use - ease of use of the nine information channels listed.

(3) Technical Quality - technical quality or reliability of the information obtainable from each of the nine channels listed (without giving consideration to the accessibility of the channel).

(4) Degree of Experience - degree of experience the engineer has had with the nine channels during his career.

The use of the Solution Development Record itself (Figure 2) has been described in detail elsewhere (Allen, 1966a; 1966b). A typical plot of alternative probabilities over time is shown in Figure 4. Plots like this were used to assist in interviewing individual engineers at completion of the study. Referring to the plot, the interviewer can frame specific questions about the

Massachusetts Institute of Technology
Solution Development Record

Name: ______________________ Date: ______________

Problem: ____

a.

alternatives under consideration	estimate of probability that a given alternative will be employed (please circle a probability estimate for each alternative)
______________________	0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0
______________________	0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0
______________________	0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0
______________________	0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0

(Circled Probabilities Should Add to 1.0)

b. If technical information having an impact upon your visualization of the problem or any of its potential solutions were received at any time during the past week, please circle the source(s) of that information on the line below.

Information Source(s):* L V C ES TS CR G E D

Figure 2. The Solution Development Record

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*See Table I.

information channels which were used to generate or reject alternatives, or that cause the preference accorded the alternatives to shift.

The channel rankings for each criterion dimension were obtained for different weeks over the course of the study. Any confusion over the meaning of each dimension was clarified at the time of the final interview, and some re-rankings were made at that time.

Using the definitions of the information channels below[*] and ignoring all considerations of the technical information expected from each of the channels, please rank the channels listed as to their "accessibility" (assign a "1" to the channel you find most accessible; a "2" to the channel you find next most accessible: etc.).

___L ___V ___C ___ES ___TS ___CR ___G ___E ___D

Figure 3a. Portion of the Channel Ranking Form for the Criterion of Accessibility.

Using the definitions of the information channels below,[*] please rank the channels listed as to their "ease of use". (Assign a "1" to the channel you find "easiest to use"; a "2" to the channel you find next "easiest to use"; etc.)

___D ___TS ___ES ___CR ___V ___L ___C ___G ___E

Figure 3b. Portion of the Channel Ranking Form for the Criterion of Ease of Use.

Assume that it is necessary for you to perform an information search for the purpose of generating a new alternative approach to the current technical problem under consideration or that you require technical information to expand or elaborate an already existing approach for solution of your technical problem. Keeping this assumption in mind and using the definitions of the information channels[*] below, please rank the channels as to the technical quality and content expected from each. Ignore all considerations of "ease of use" and "accessibility" as they might relate to a given channel. (Assign a "1" to the channel you find highest in quality and content; a "2" to the channel having the next highest technical quality and content; etc.)

___L ___V ___C ___ES ___TS ___CR ___G ___E ___D

Figure 3c. Portion of the Channel Ranking Form for the Criterion of Perceived Technical Quality.

The purpose of this questionnaire is to ascertain your subjective estimate of the amount of experience you have had with the information channels considered in this study. You are not asked for absolute rankings but for relative rankings. The definitions of the various information channels appear below.[*] Keeping these definitions in mind, please rank the information channels below as to the relative amount of experience you have had with each one. (Assign a "1" to that channel with which you have had most experience during your engineering career; a "2" to that channel which ranks second in your amount of experience; etc.)

___TS ___V ___L ___D ___E ___C ___G ___CR ___ES

Figure 3d. Portion of the Channel Ranking Form for Degree of Experience.

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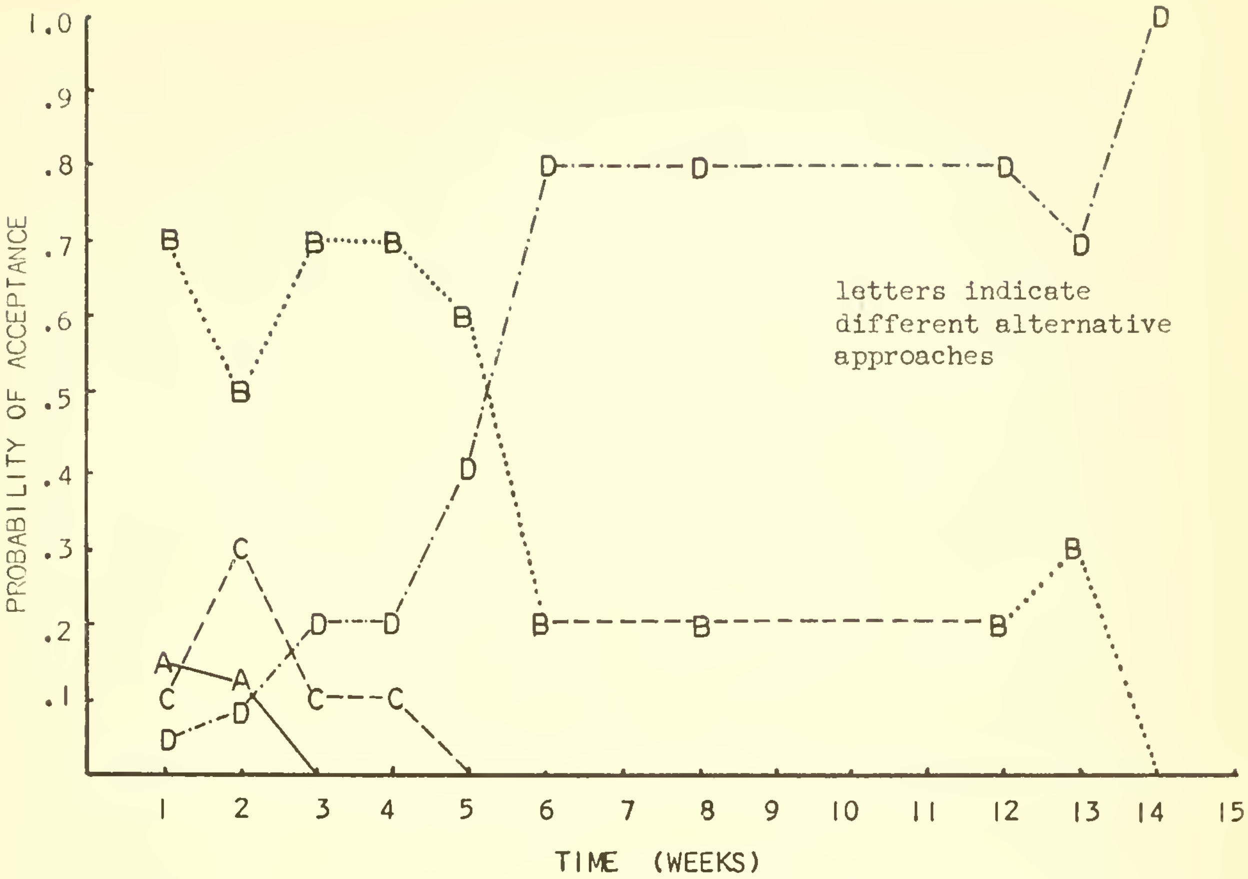
[*] See Table I.

NOTE: Each of the Channel Ranking Records shown in this figure was originally a separate questionnaire administered at a different point in time.

Table I

Information Channels

L = literature:	books, professional, technical and trade journals and other publicly accessible written material.
V = vendors:	representatives of, or documentation generated by suppliers or potential suppliers of design components.
C = customer:	representatives of, or documentation generated by the government agency for which the project is performed.
ES = external sources:	sources outside the laboratory or organization which do not fall into any of the above three categories. These include paid and unpaid consultants and representatives of government agencies other than the customer agency.
TS = technical staff:	engineers and scientists in the laboratory who are not assigned directly to the project under consideration.
CR = company research:	any other project performed previously or simultaneously in the laboratory or organization regardless of its source of funding. This includes any unpublished documentation not publicly available, and summarizing past research and development activities.
G = group discussion:	ideas which are formulated as the result of discussion among the immediate project group.
E = experimentation:	ideas which are the result of test or experiment or mathematical simulation with no immediate input of information from any other source.
D = other division:	information obtained from another division of your company



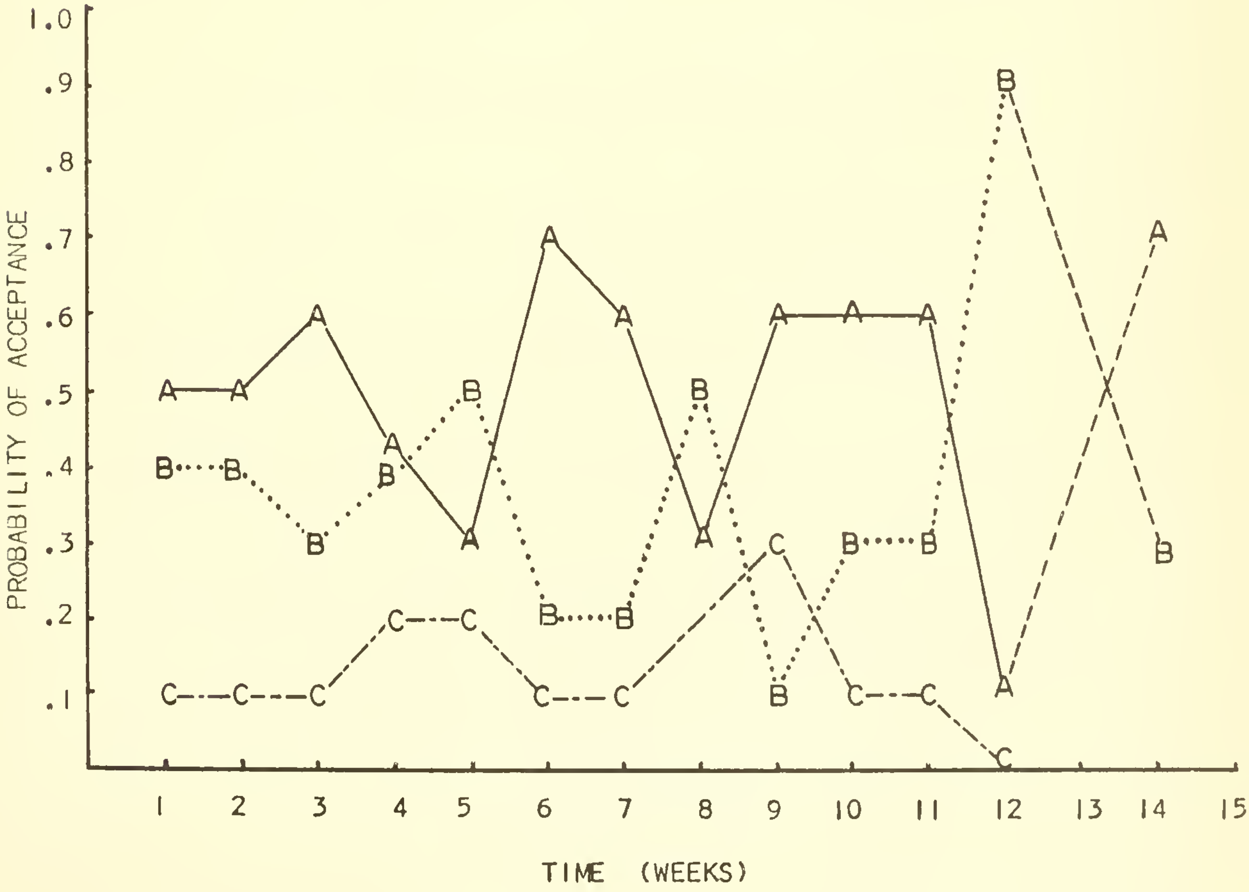


FIGURE 4. TYPICAL SOLUTION DEVELOPMENT RECORD PLOTS

The resulting rank orders of information channels for each criterion provide subjective estimates of "channel cost" and "channel payoff," or value. These channel rankings can be tested for correlation with rank orders based on the frequency-of-use determined from Solution Development Record data. This technique makes possible the identification of the relative importance of various criteria in information channel selection. The post-project interview was also used to determine the information sources which had brought to mind each of the solution alternatives considered by each engineer.

RESULTS

Seven hypothesis are tested in the study. All are concerned with predicting the criteria which determine both the frequency with which an information channel is used and the order in which it is consulted by an engineer requiring information:

(1) those information channels which are considered more readily accessible will be used more frequently than less accessible channels,

(2) those information channels which are considered easier to use will be used more frequently than less easy to use channels,

(3) those information channels which are believed to provide information of higher quality will be used more frequently than those providing lower quality, less reliable information,

(4) those information channels which are considered more readily accessible will be used first in the course of an active information search,

(5) those information channels which are considered easier to use will be used first in the course of an active information search,

(6) those information channels which are believed to provide information of higher quality or reliability will be used first in the course of an active information search,

(7) a greater proportion of ideas (measured by the ratio of messages accepted to those received) will be accepted from those information channels which are believed to provide information of higher quality or reliability.

Frequency of Use

Testing the first hypothesis, we find (Table II a strong relation (Kendall Tau = 0.67, $p < 0.01$) between channel accessibility and frequency of use. This first order test provides substantial support for the first hypothesis. Turning to the second criterion, ease of use, a somewhat weaker relationship (τ = 0.44, $p < 0.06$) is found between the channel rankings. The application of partial correlation analysis (Table III) to the data clearly reveals the magnitude and direction of the relationship. Accessibility is definitely the dominant

Table II

Comparison of Frequency of Use With Median Rank Orderings Assigned to Information Channels on the Basis of Three Criteria (Nineteen R&D Engineers)

	Criterion			Frequency of Use
	Accessibility	Ease of Use	Technical Quality	
Literature	3	3	1	1
Vendors	4	5	8	3
Customer	7	8	9	6
External Sources	8	9	6	7
Technical Staff	2	1	3	4
Company Research	6	6	5	9
Group	1	2	4	2
Experimentation	5	4	2	5
Other Division	9	7	7	8

Table III

Relation of Three Selection Criteria to Frequency of Information Channel Use

Correlation between frequency of use and:	Kendall Tau	Kendall Tau (partialled)	variable partialled out
perceived accessibility	0.67^{**}	0.58	ease of use
		0.64	tech. quality
perceived ease of use	0.44^{*}	-0.18	accessibility
		0.36	tech. quality
perceived technical quality	0.28	0.03	accessibility
		0.08	ease of use

$^{*}p < 0.05$

$^{**}p < 0.01$

cost criterion determining the relative frequency with which information channels are used. When accessibility is held constant, ease of use actually shows a slightly negative relation with frequency of use. Similarly, in the case of perceived technical quality, there is a weak positive relation with frequency of use, but when accessibility is controlled, the relation approaches zero. Apparently, in the minds of the subjects, there is some relation between their perceptions of technical quality and channel accessibility, but it is the accessibility component which almost exclusively determines frequency of use.

First Sources

Each subject was asked once a week to report two instances during the preceding week in which he actively sought information. In each instance, subjects reported whether or not the search was "successful," and the order in which they contacted channels. A total of 154 searches were reported.

Table IV presents the correlations between frequency of selection as a first source and the three criterion variables. Here again accessibility appears as the dominant criterion upon which selection is based. Engineers turn first to that channel which is most accessible; perceived technical quality influences this decision only to a minor extent.

Table IV

Relation of Three Selection Criteria to Frequency of Channel Selection as a First Source

Correlation between frequency of selection as a first source and:	Kendall Tau	Kendall Tau (partialled)	variable partialled out
perceived accessibility	0.67^{**}	0.57 0.61	ease of use tech. qual.
perceived ease of use	0.44^{*}	-0.16 0.31	accessibility tech. qual.
perceived technical quality	0.39	0.19 0.21	accessibility ease of use

$^{*}p < 0.05$

$^{**}p < 0.05$

The Effect of Experience

One would expect that the degree of experience which an engineer has with a given information channel would influence his perception of both costs and value associated with that channel. He might never use the library, for example, because of a misperception that it contains nothing of value, or that it is really too difficult to find what you are looking for. Given some moderate amount of experience with library use, however, he may come to adjust these perceptions so that they are more in accord with reality. Similarly with interpersonal channels, increased experience should adjust perceived costs. The adjustment can, of course, mean either an increase or decrease in perceived cost, and may be entirely random, increasing for some individuals or channels and decreasing for others. Should the latter situation hold, correlation analysis will fail to detect any systematic trend, and a zero correlation will be found between experience and perceived cost. If, however, experience brings about a systematic shift (most subjects shifting in the same direction with respect to most channels), correlation analysis can detect this phenomenon and will show a positive or negative correlation between experience and cost.

Table V shows the nine channels arranged according to the amount of experience the engineers report having had with each of them. Table VI demonstrates quite clearly that a strong positive relationship holds between the degree of experience an engineer has had with a given channel and both perceived accessibility and ease of use.

Of course, the engineer may simply refer more frequently to those channels which he sees as more accessible or easier to use. In other words, the direction of causality may be from cost to experience. Lower cost channels

Table V

Median Rank Ordering of Information Channels on the Basis of Degree of Experience (19 R&D Engineers)

Information Channels	Ranking Assigned
LITERATURE	1
GROUP	2
EXPERIMENTATION	3
TECHNICAL STAFF	4
VENDORS	5
COMPANY RESEARCH	6
CUSTOMER	7
OTHER DIVISION	8
EXTERNAL SOURCES	9

Table VI

Correlation and Partial Correlation Coefficients for Relation Between Degree of Experience and Perceived Costs of Using Information Channels

correlation between degree of experience and:	Kendall Tau	Kendall Tau (partialled)	variable partialled out
accessibility	0.72^{**}	0.37	ease of use
		0.53	frequency of use
ease of use	0.72^{**}	0.37	accessibility
		0.60	frequency of use
frequency of use	0.61^{**}	0.25	accessibility
		0.51	ease of use
technical quality	0.56^{*}	0.43	accessibility
		0.32	ease of use
		0.39	frequency of use

$^{*}p < 0.05$

$^{**}p < 0.01$

are used more and he thereby accumulates greater experience with them. To test this possibility and determine causal direction, the frequency with which the engineers used the nine channels is controlled and the relation between experience and perceived cost again tested (Table VI). This reduces both of the original relations somewhat, but reasonably strong correlations remain, thus indicating that the degree of experience that an engineer acquires with an information channel does tend to lower his perception of the cost of using that channel.

Perception of Technical Quality

Allen (1966b) measured the rate at which information channels were responsible for generation of alternative ideas and the rate at which ideas emanating from each information channel were accepted as the solutions to engineering problems. The ratio of these two parameters (channel acceptance ratio) was then used as a measure of the propensity for engineers to apply a filtering process to channel output. A relatively low acceptance ratio, in this sense, implies that a more severe filter has been applied to a channel; a high acceptance ratio implies the relative absence of filtering. Information from vendors is found, for example, to be subjected to more severe filtering than information obtained from an engineer's technical staff.

If, in fact, such a filtering process operates, it should generally be based upon the engineer's assessment of the quality and reliability of the information provided by a channel, and there is little likelihood that it would be based upon channel cost. The engineers in the sample were asked to provide just this assessment for each channel in the form of a rank ordering. In addition, the channels responsible for generating all considered alternatives

(as reported on the Solution Development Records) were ascertained during the final interviews. Thus, it is possible to derive an acceptance ratio for each of the channels.[2]

Since many of the problems examined were not completed successfully during the course of this brief study, and because the sample of problems was small to begin with, the number of messages received and accepted from each channel is believed to be too small for the generation of meaningful acceptance ratios. For this reason, Allen's (1966b) data are included in Table VII and are

Table VII

Sources of Ideas and Acceptance Ratios

Information channels	Number of messages received		Number of messages accepted		Overall acceptance ratios
	present data	Allen (1966b) data	present data	Allen (1966b) data	(messages accepted/ messages received)
LITERATURE	7	71	5	27	0.41
VENDOR	4	72	2	37	0.37
CUSTOMER	7	101	1	33	0.24
EXTERNAL SOURCES	5	132	1	41	0.49
TECHNICAL STAFF	10	45	6	24	0.55
COMPANY RESEARCH	25	38	11	20	0.49
GROUP	15	-	4	-	0.27
EXPERIMENTATION*	1	-	0	-	**
OTHER DIVISION	1	-	0	-	**
Unknown	20	75	3	6	-

*These channels were not considered in the Allen study.

**Too few messages received to develop a meaningful acceptance ratio.

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[2] Two of the channels, "experimentation" and "other division," generated only one message apiece. No acceptance ratio is calculated for these channels for reason of insufficient data.

aggregated with the present data in computing acceptance ratios.

In Table VIII, the acceptance ratios are correlated with each of the three criterion variables that were measured in the study. Perceived technical quality is the only channel characteristic which correlates significantly with acceptance ratio. This is quite the reverse of what has been observed up until this point. Neither accessibility nor ease of use appear to influence acceptance rate to any extent. The engineer's perception of the technical quality of information channels, however, does influence the rate at which he accepts ideas from those channels. In other words, the filtering process is based at least in part on the perception of technical quality, and not at all on accessibility or ease of use.

Table VIII

Relation of Three Selection Criteria to
Message Acceptance Ratio of Information Channels

correlation between message acceptance ratio and:	Kendall Tau	Kendall Tau (partialled)	variable partialled out
perceived accessibility	0.05	-0.19	ease of use tech. quality
perceived ease of use	0.14	0.23 -0.11	accessibility tech. quality
perceived technical quality	0.43*	0.45 0.42	accessibility ease of use

*$p < 0.05$

DISCUSSION

Any assumption that engineers act in accord with a simple instrumental learning model in which they turn most frequently to those information channels which reward them most often should now clearly be laid to rest. Engineers, in selecting among information channels, act in a manner which is intended not to maximize gain, but rather to minimize loss. The loss to be minimized is the cost in terms of effort, either physical or psychological, which must be expended in order to gain access to an information channel.

Their behavior is, in this way, reminiscent of Zipf's "law of least effort." According to Zipf's Law, individuals, when choosing among several paths to a goal, will base their decision upon the single criterion of least average rate of probable work. In other words, to minimize his average rate of work expenditure over time, "... an individual estimates the probable eventualities, and then select(s) a path of least average rate of work through these."

In the selection of information channels, our engineers certainly appear governed by a principle closely related to Zipf's Law. They attempt to minimize effort in terms of the work required to gain access to an information channel. However, they either ignore probable future work (searching through other channels, upon failure to find the needed information through the first channel), or they are unable to estimate it. If, in fact, engineers were to consider future effort in making their decision, we would expect to find a negative correlation between the mean number of channels which must be used to gain the desired information after selecting one channel as the first source. In other words, for each time that a given channel is chosen as a first source, the number (including zero) of channels which had to be used before the information was

in hand can be counted. The mean number of additional channels used can be computed for each channel. This mean score serves as an index of the long term effort (over and above that effort connected with gaining access) associated with each information channel. That correlating this index with the frequency of use of each channel produces a near-zero correlation indicates that engineers do not take this long term effort into account in selecting channels. So we are left with engineers behaving according to a simplified version of Zipf's Law, in which they take only their immediately predictable effort into account and minimize that parameter in making their decision.

The implications of this finding are very important. Improving the quality or performance of a particular information service will not, in and of itself, lead to increased use of the service. More investment in library holdings, for example, will be wasted unless at the same time we make this material more accessible to the user. Engineers won't simply be attracted to the library by improvements in the quality or quantity of the material contained there. The library must, in a sense, come to them.

Those concerned with R&D management whether they are laboratory directors, librarians or administrators of professional engineering societies have both dimensions of this problem, to varying degrees, within their control. To some extent they can control the quality of the information which is available through certain channels. The laboratory director, for example, can through hiring make available a more competent technical staff to improve the quality of internal consulting. The librarian can improve the extent and quality of the material contained in the library. The professional societies can through careful editing and review improve the quality of their present publications or make new

publications or services available to the membership. Improvements in any or all of these directions may well be desirable. But it must be remembered that such improvement, by itself, will not guarantee any improvement in the performance of the organization or of the engineering community. Before the improved information service can lead to increased performance, it must be used! And the only way to increased use is through increased accessibility. Fortunately, however, this parameter can usually be quite readily controlled by managment. The laboratory director must not just hire more competent technical staff, he must encourage their use as consultants by rewarding them for this function, and by encouraging his engineers to go to them for information. He must make it known that no one will downgrade a man for seeking help and take steps to reduce the psychological risk and cost in internal consulting. The librarian must make his services more readily available. This may involve some rather expensive additions to personnel (library assistants specializing in particular technical areas, special messenger services, mobile libraries, etc.). But unless this additional investment is made, the money spent on library holdings and facilities will be wasted. The engineering societies, too, can make their services more accessible. Many such improvements, as for example selective dissemination, demand deposit and the publication of critical annual reviews with extensive reference lists, have been discussed in recent years, and many of these hold great promise. But there is a more important step which the societies might take to make their material more accessible. The principal reason for the reluctance of engineers to use their professional literature is that, for the most part, they cannot understand it. Most of the professional engineering literature is too mathematically sophisticated for the average engineer

to comprehend. It is therefore inaccessible to him. Now if one wishes to bring engineers into greater contact with their literature, there are two obvious approaches. The first is to operate on the engineer and enhance his mathematical sophistication; equip him so that he can understand the literature as it now exists. The second and perhaps more tractable approach is to bring the literature to the engineer. The professional societies should publish a literature form, whose technical content is reasonably high, but which is understandable by the audience to whom it is directed. This is not an easy task. And it does not necessarily imply that the societies forego all of their present program of publications. What it does mean is that these publications are at least supplemented by a series of more readable works. That this can be done is amply demonstrated by the success of a large number of profit-making, controlled circulation publications, which engineers do read (Allen, 1966c). The engineering societies should give up their style of emulating the scientific societies. Their goals are different. There is nothing wrong with publishing non-original contributions in engineering. The goal of engineering publication is to inform, not to stake out claims. Only when the engineering societies come to realize this will they serve their audience properly.

Furthermore, since engineers perceive channels to be more accessible as they gain greater experience in using them, any steps to increase use through improving accessibility will be self-reinforcing. As laboratory managers make their internal consultants more accessible, they will come to be used more and the engineers' perception of their accessibility will be further enhanced. As engineers gain more experience with the more accessible professional literature, their perception of increased accessibility may generalize to the more sophisticated literature and encourage them to work toward improving their ability to comprehend this literature.

Engineers, it is true, do compensate, by varying the degree of skepticism with which they filter the ideas received, for their lack of attention to quality when selecting an information channel. This is an interesting phenomenon in which technical quality is recognized, but its consideration is delayed until after the channel has been selected. Accepting or rejecting messages (components of alternatives, see Figure 1), is a process which takes place over a considerable period of time. The focus during this period is technical quality (including, of course, cost and availability). The alternatives under consideration are quite rigorously compared in terms of this dimension. It is no wonder then that the perceived reliability of the source is taken into account, and that ideas are accepted or rejected partly on that basis.

From a simple engineering viewpoint, this seems to be an appallingly inefficient way of doing things: using the wrong criterion early, and later correcting for it. This is one more reason why we must take steps to aid the engineer in overcoming the channel selection problem. Many of the suggestions made earlier in this section should more than pay for themselves in terms of engineering effort conserved.

CONCLUSIONS

Empirical support is found for the model of the information channel selection process first proposed by Allen (1966c). In this process, channel selection is based almost solely on channel accessibility, the most accessible channels being used first. The difficulties inherent in this process are then countered by a filtering process which applies a variable degree of skepticism to ideas supplied by different channels. The degree of skepticism is a function

of the engineer's perception of the technical quality of the information normally provided by the channel.

The following specific conclusions are derived from the study:

1. Accessibility is the single most important determinant of the overall extent to which an information channel is used.

2. Both accessibility and perceived technical quality influence the choice of first source.

3. Perception of accessibility is influenced by experience. The more experience an engineer has with a channel, the more accessible he perceives it to be.

4. The rate at which ideas are accepted or rejected is related to the perceived quality of the information provided by a channel. Engineers thus use technical quality as the criterion in a filtering process which compensates, in part, for the neglect of technical quality considerations when selecting an information channel.

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